

REMARKS

The foregoing amendments to the claims have been made merely as to matters of form, and no changes as to substance have been made because Applicants believe that the earlier-presented claims are patentable over the cited references for the reasons which were previously stated. In this regard, reconsideration is requested for these same reasons as amplified herein.

First Applicants point out that Claim 1 relates to a process for forming a silicon-based thin film containing a crystalline phase, and that an object of the present invention is to form at high speed a high quality silicon thin film with an excellent crystallinity. To this end an essential feature of the present invention is the predetermined concentration of oxygen of from 0.1 ppm to 0.5 ppm in the material gas, because both too high a concentration and too low a concentration of oxygen fail to provide the effects of the present invention.

As a basis for rejecting Applicants' claims the Examiner relies primarily on the cited Matsuda patent combined with the two cited Yamazaki patents. First, the Office Action acknowledges the deficiencies of Matsuda as a rejecting reference, but relies on the two Yamazaki patents as disclosing the subject matter of those deficiencies. For the reasons stated in detail below, Applicants submit that there is no suggestion in the prior art to combine the various patents in a manner which would suggest Applicants' claimed invention.

First, it is noted that the Yamazaki '264 patent has an object to intensify photo-sensitivity and to reduce a Staebler-Wronski effect (column 3, lines 11 to 20). It is disclosed that a concentration of impurity such as oxygen is reduced to achieve this object,

and in the BACKGROUND OF THE INVENTION, that a conventional non-single crystalline silicon film contains oxygen in a concentration of above 10^{20} atom/cm³ (column 1, line 66 to column 2, line 9). Also, the Staebler-Wronski effect relates to a deterioration caused by light irradiation in amorphous silicon, and the i-type semiconductor layer 5 of the Yamazaki '264 patent is not a crystalline thin film semiconductor (see column 5, lines 54 to 57). Moreover, it is best that the concentration of an impurity such as oxygen, which causes the Staebler-Wronski effect and lowered photo-sensitivity, is zero. Accordingly, the Yamazaki '264 patent neither discloses nor suggests that the predetermined concentration of oxygen is intentionally contained in the material gas. Furthermore, that reference never discloses a "crystallinity" of the silicon thin film, and it is well known that physical properties and production methods of a crystalline silicon thin film and those of an amorphous silicon thin film are remarkably different.

For these reasons it is respectfully submitted that there is no suggestion in the prior art to combine the disclosures of the Matsuda and Yamazaki '264 patents as a basis for rejecting Applicants' claims.

Referring now to the Yamazaki '794 patent, it discloses that when photo-sensitivity is low a cause of instability occurs when sodium, oxygen or the like, contained in an amount of 10^{20} atoms/cm³ or more, generates dangling bonds and the dangling bonds act as recombination centers (column 2, lines 31 to 49; column 3, lines 12- to 17). To preclude this effect it is the best that the concentration of impurity such as oxygen, which becomes a recombination center, is zero. Thus, the Yamazaki, '794 patent neither discloses nor suggests that the predetermined concentration of oxygen is intentionally contained in the material gas. Also, it should be noted that oxygen is the cause of

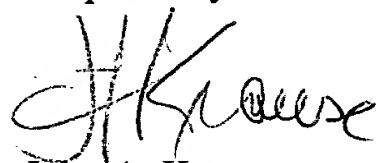
recombination centers and it is an impurity inevitably contained in the Yamazaki '794 patent which discloses a production method for reducing Na and O². Furthermore, that reference never discloses crystallinity of a silicon thin film.

Accordingly, although the Matsuda patent discloses a method of producing a silicon crystalline thin film using plasma CVD and that the material gas to be used in the method contains SiF₄ and O₂, one of ordinary skill in the art would not combine the cited prior art to arrive at the claimed feature of the present invention, wherein the predetermined content of oxygen (0.1 ppm to 0.5 ppm) is intentionally contained in the material gas. Instead, the goal of the secondary references is to exclude oxygen.

In view of the foregoing remarks, Applicants respectfully request favorable reconsideration and the allowance of the present application.

Applicants' undersigned attorney may be reached in our New York Office by telephone at (212) 218-2100. All correspondence should continue to be directed to our address listed below.

Respectfully submitted,



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